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Report of the

DEPARTMENT OF HIGHWAYS
STATE OF NEVADA

For the Fiscal Years Ending June 30

1949-1950

W. T. HOLCOMB
State Highway Engineer

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Biennial report of the Department of Highways.
Nevada. Department of Highways.
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STATE OF NEVADA

SEVENTEENTH BIENNIAL REPORT

OF THE

DEPARTMENT OF HIGHWAYS

For the Fiscal Years of
July 1, 1948, to June 30, 1950

W. T. HOLCOMB
State Highway Engineer

CARSON CITY, NEVADA
STATE PRINTING OFFICE - - JACK McCARTHY, SUPERINTENDENT
1950

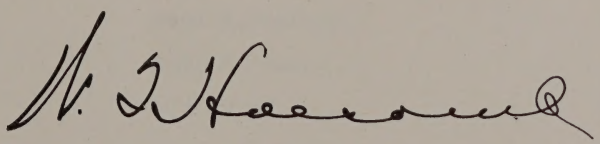
TYPOGRAPHICAL
UNION
LABEL
WASHOE

LETTER OF TRANSMITTAL

To the Honorable Members of the Board of Directors
and the Nevada State Legislature:

There is submitted herewith the Seventeenth Biennial Report of the Nevada Department of Highways covering the activities of the Department for the fiscal years of 1949 and 1950.

The administration of this Department during the past biennium has received the cooperation and support of its Board of Directors, the Bureau of Public Roads, and the citizens of Nevada. It is therefore proper at this time that we express our sincere appreciation.



State Highway Engineer.

In Memoriam

During the biennium the following employees of the Department of Highways were taken by death.

RAYMOND F. EDDY

FRANK L. GARAVENTA

R. F. CRAWFORD

FRED BAUMBACH

EARL F. STONE

E. T. CLYDE

DEDICATION

The Seventeenth Biennial Report of the Nevada Department of Highways is dedicated to the many employees whose faithful service of many years has been an essential factor in making Nevada a leader among the road builders of the Nation. This report gives opportunity to mention the names of those who have been with the Department for 30 years.

30 OR MORE YEARS OF SERVICE

BERNING, AUGUST, JR.
HOLCOMB, WILLIAM T.
POHL, ERNEST C.
REID, BONNIE O.

25 TO 30 YEARS OF SERVICE

ARMSTRONG, GLEN F.
BOYER, CHARLES C.
CROSS, ERNIE
EGAN, GEORGE R.
GLOCK, J. A.
HANCOCK, J. LESLIE
HEIDENREICH, ANDREW J.
LEWIS, ROBERT J.
LOGAN, BEN H.
MILLS, HUSTON D.
MILLER, FRANK E.
PARRY, WILLARD R.
RAWLS, PAUL
ROSE, VERNON D.
SCHULTZ, MARION I.
SUTHERLAND, DAVE
SULLIVAN, JOHN M.
WRIGHT, OTIS W.

20 TO 25 YEARS OF SERVICE

BERGER, FRANK J.
BLAKER, CHARLES C.
BODEN, ELDOR J.
BROWN, HIRAM C.
CARROL, FRANK J.
DUNN, WALTER E.
ELDREDGE, REUBEN E.
HAYS, D. H.
HARMER, FRANK J.
HEAPS, WILFORD H.
LEUTZINGER, EDWARD C.
LITTLE, LAWRENCE W.
MORRISON, FRANKLIN H.
MUGARTEGUI, LORENZO
MULLIN, RAYMOND F.
PERRY, JAMES A.
QUINLAN, ALICE F.
ROY, ROLAND F.
SQUIRES, HERBERT A.
VAUGHAN, HAROLD J.
WAITE, MARVIN H.

15 TO 20 YEARS OF SERVICE

AUSTIN, NEIL H.
BENNETTS, R. H.
BROCKWAY, GORDON B.
BOARDMAN, EDGAR T.
BONAFOUS, JOE
BORGNA, VICTOR E.
CLYDE, VICTOR W.
COLEMAN, GEORGE P.
COLLINS, W. H.
CHRISTENSEN, JOSEPH H.
DRON, THOMAS L.
DOTY, STANLEY P.
FELL, VERRILL W.
FERRETTI, EUGENE L.
FODRIN, MELVIN J.
GIBSON, W. H.
GREENHALGH, JACK
GREEN, ARTHUR T.
HANNIG, REEDY
HARBIN, GUY S.
KINNE, ALFRED G.
KOONTZ, LOUIS K.
KRAMER, A. T.
LEAVITT, THOMAS D.
LOWER, RALPH E.
MCCOY, JOHN

McInnis, J. R.
McMurtrey, E. A.
Manhire, John T.
Marco, King D.
Meacham, Joseph D.
Mack, Leon A.
Meder, Zita D.
Melarkey, C. V.
Miles, Cyril D.
Miles, George J.
Marty, Gene
Monahan, George C.
Murphy, C. E.
Odell, Wilfred A.
Ottini, Ralph J.
Parvin, Jack A.
Robbins, Paul E.
Scoggins, Eston G.
Sharpe, Dave
Smith, Charles F.
Springmeyer, Carl A.
Sundeen, Stanley D.
Stewart, Ray
Welsh, Andrew
Wilson, Walter C.
Woodgate, Percy L.
Walker, Oren W.

STATE HIGHWAY OFFICIALS AND HEADS OF DEPARTMENTS

BOARD OF DIRECTORS

Hon. Vail Pittman, *Governor of Nevada*.....Chairman
Hon. Alan H. Bible, *Attorney General*.....Member
Hon. Jerry P. Donovan, *State Controller*.....Member

DEPARTMENT OF HIGHWAYS

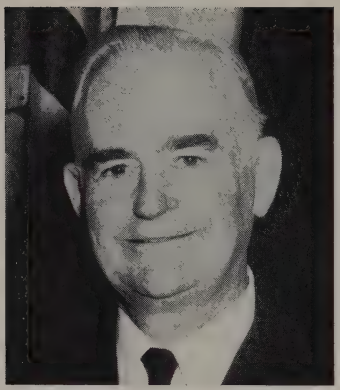
W. T. Holcomb.....State Highway Engineer
H. D. Mills.....Assistant State Highway Engineer
George R. Egan.....Engineer of Surveys and Design
J. D. Meacham.....Construction Engineer
A. Berning, Jr.....Engineer of Personnel
Matt Walsh.....Equipment Superintendent
C. C. Boyer.....Engineer–Federal Aid Roads
F. H. Morrison.....Materials and Research Engineer
E. T. Boardman.....Bridge Engineer
Alfred G. Kinne.....Right-of-Way Engineer
Paul R. Rawls.....Location Engineer
E. C. Pohl.....Auditor
Robert F. Guinn.....Planning Survey Engineer
C. V. Melarkey.....Office Engineer
Frank Berger.....Field Engineer
Stanley D. Sundeen.....Chief Draftsman
Ralph Ottini.....Traffic Engineer

DIVISION ENGINEERS

W. O. Wright.....Division No. 1
J. L. Hancock.....Division No. 2
Julian A. Glock.....Division No. 3
W. R. Parry.....Division No. 4
Denton H. Hays.....Division No. 5

ASSISTANT DIVISION ENGINEERS

G. B. Brockway.....Division No. 1
H. A. Squires.....Division No. 2
R. E. Eldredge.....Division No. 3
Paul Robbins.....Division No. 4



GOVERNOR VAIL PITTMAN
Chairman, Board of Directors

ALAN H. BIBLE
Attorney General
Member, Board of Directors

JERRY P. DONOVAN
State Controller
Member, Board of Directors

WILLIAM T. HOLCOMB
State Highway Engineer

DEPARTMENT OF HIGHWAYS
SEVENTEENTH BIENNIAL REPORT

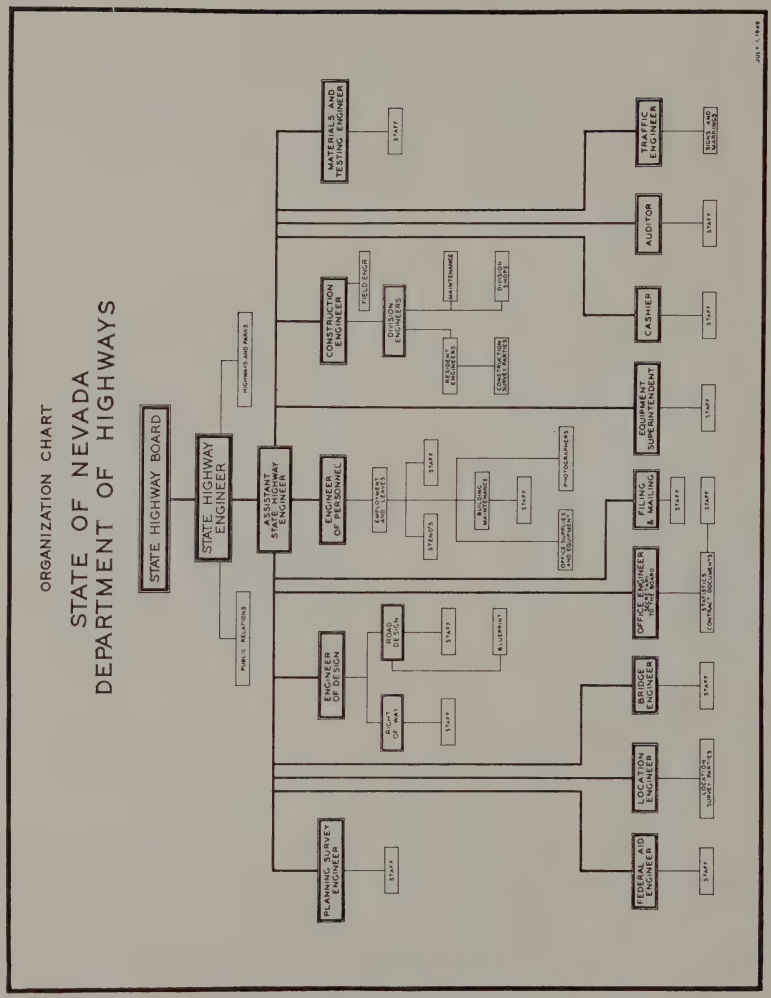
Since the Fourteenth Biennial Report, made during the closing days of the second world conflict, it has been the theme of the succeeding Biennial Reports to mention the sudden economical change in the functions of the Highway Department. It was a common prayer, once the war was over, that production and manpower conditions would return to "normal." By normal, it was meant prewar wages and prewar material availabilities. However, everyone, all business houses across the Nation as well as within the State, and all State departments soon found there was no such "return to normal." Thus, the Fourteenth, Fifteenth and Sixteenth Reports mentioned that it had become increasingly difficult to find capable personnel, either in the field or in the offices, who would be content to work for the salary that the State offices were able to pay. It also became quite evident that certain essential materials whose priority had been relaxed following the closing of the war, would not become available either in the full supply or in the low cost as they were prior to World War II. This report could very easily be a repetition of the complaint that has been made by many that it is no longer possible to buy the goods today with the same dollar that bought merchandise prior to the war; this Department has had to adjust its operations to the current conditions as they unfolded themselves during the years of the biennium.

In preparing this Report of the accomplishments of this Department, it has been necessary to list the many contracts of new construction and of reconstruction on both those roads receiving Federal-aid and those roads being built or reconstructed with State moneys. It has also been necessary to inventory the total amount of maintenance on all the roads maintained by the State Highway Department. It was discovered that the number of miles in the road system has greatly increased, necessitating additional manpower and equipment to maintain these roads. Thus, an increased amount of expense has been incurred in the maintenance of the roads.

It is suggested that extreme caution be exercised with respect to adding more roads to the secondary highway system, which would require construction, reconstruction and maintenance by this Department.

The cost of right of way acquisition has increased alarmingly, due to the greater amount of work performed on the primary system in the urban areas. This is also true in the construction of secondary roads within highly cultivated areas, where it is necessary to make readjustments of agricultural facilities.

In letting contracts for construction and reconstruction, it has been noted that the contractors found it necessary to raise their average cost per mile of construction or reconstruction because they, too, were faced with the increased labor cost, the higher prices for essential equipment, and the increased cost of materials.


ORGANIZATION CHART
STATE OF NEVADA
DEPARTMENT OF HIGHWAYS
STATE HIGHWAY BOARD
STATE HIGHWAY ENGINEER
PUBLIC RELATIONS
HIGHWAYS AND ROADS
ASSISTANT STATE HIGHWAY ENGINEER
ENGINEER OF PERSONNEL
ENGINEER OF DESIGN
ROAD DESIGN
BRIDGE DESIGN
STAFF
BLUEPRINTS
PLANNING SURVEY ENGINEER
FEDERAL AID ENGINEER
LOCATION ENGINEER
LOCATION SURVEY PARTIES
BRIDGE ENGINEER
OFFICE ENGINEER (CHIEF CLERK)
STATISTICS CONTRACT DOCUMENTS
FILING & MAILING
EQUIPMENT SUPERINTENDENT
OFFICE SUPPLIES AND EQUIPMENT
PHOTOGRAPHERS
BUILDING MAINTENANCE
STENOS
EMPLOYMENT RECORDS
CONSTRUCTION ENGINEER
FIELD ENGR
DIVISION ENGINEERS
RESIDENT ENGINEERS
CONSTRUCTION SURVEY PARTIES
MAINTENANCE
DIVISION SHOPS
MATERIALS AND TESTING ENGINEER
CASHIER
AUDITOR
TRAFFIC ENGINEER
SIGNS AND MARKINGS
JULY 1, 1949

During the last meeting of the Legislature this Department prepared certain recommendations that were believed necessary to improve the conditions facing this Department during 1949. One of the recommendations was that the revolving fund of $60,000 be increased to $100,000. The Legislature accepted this recommendation and made possible a fund that would take care of salary, emergency right of way payments, driver's license refunds, travel and subsistence claims. At this time, the Department is pleased to report that the revolving fund is now sufficient to carry on the daily operations, eliminating the necessity of filing claims seven or eight times per month. This was accomplished by using existing highway funds, eliminating any further appropriation.

It was also mentioned that the present quarters of the State Highway Department in the Heroes Memorial Building were inadequate and a new office building, properly designed to house the departments that would use it, should be made available. At time of this writing, it is anticipated the new State Office Building will be ready for occupancy early in 1951, and it is expected that it will adequately house the present staff and any immediate increase in employees.

It was also recommended that the Legislature take cognizance of the increased cost of passenger-type automobiles necessary for this Department's use and grant the Department authority to purchase cars at not more than $2,500. Since 1949, several manufacturers of the lower-priced cars have raised, and indicate further raises, in prices of cars of their manufacture. However, the Department feels that there will be a sufficient variety of cars available for purchase at less than the $2,500 limit.

The last Legislature saw fit to remove the Drivers License Division and the Highway Patrol from the Highway Department administration and place these divisions under the control of the Public Service Commission. On July 1, 1949, this change was accomplished and the efficiency of both Departments was notably affected by that change.

Other recommendations included a request that the Department be allowed to make pay-roll payments at regular two-week periods rather than on a semimonthly basis. The granting of this request has materially aided the finance and bookkeeping divisions, as well as aiding the morale of the employees.

At this time, the Legislature is asked to consider the extreme necessity of making available to the Highway Department the funds to provide necessary and substantial equipment with which to protect the investment in the State highway system. Improvements are needed throughout the State in the way of housing maintenance employees, and buildings for shops and division offices. For example, the division shops at Tonopah are now housed in two yards, one on each side of highway U S 95. There is not enough ground space to properly store the vehicles necessary to maintain the roads within this division. Warehousing is not available to protect and store the many varieties of materials and equipment needed to carry on the functions of road maintenance in this important part of the State. Inadequate facilities, cumbersome storage, and crowded conditions, all bring about a loss of efficiency and higher cost of maintenance.

A similar condition exists in Elko where lack of space prevents proper repairs and servicing of equipment used to maintain and patrol the road system in that division. Road maintenance machinery is expensive and requires considerable service to keep it in condition to do the job for which it is intended. Relocation and the construction of proper facilities at both of these division headquarters would expedite repairs and result in a lower maintenance cost of the road system, as well as greater efficiency on the part of both employee and equipment.

Because of great distances between towns in this State it is necessary to locate maintenance stations in uninhabited sections along the highway system. By providing residence facilities for the maintenance crews and their families the Department is able to have men and equipment available in the places needed at the lowest possible cost. Many of these maintenance stations are equipped with inadequate housing, or housing that has deteriorated beyond repair, to the point they are unusable as living accommodations. In order that our maintenance personnel may be built up of dependable, reliable employees, and as a means of assuring the traveling public that roads will be kept open regardless of weather, as well as providing the maximum amount of protection of the State's investment, it is respectfully recommended that funds be made available for the reconstruction of approximately 12 maintenance stations throughout the State.

The costs of both the reconstruction and relocation of division headquarters shops and maintenance storage facilities in Elko and Tonopah, the construction of 12 maintenance stations, the higher cost of right of way acquisition, and the necessity of using State funds only for reconstruction of obsolete roads, have increased to such an extent that additional revenue will be required to carry on the functions of this Department.

PERSONNEL

The Department of Highways, at present, is confronted with a condition which reflects a shortage of experienced technical help in many of its units, both in the field and at headquarters office. We are constantly attempting to secure additional needed competent personnel, particularly for our engineering departments. Even with the inducement of an increased salary basis, which has become effective since the last biennium, this Department is unable to compete with private industry and other outside agencies in securing the trained manpower so necessary in maintaining the high standards of highway department, and highway construction practices.

Because certain phases of highway engineering and administration have become highly specialized, such engineering and administrative positions cannot be filled by persons with qualifications of general training only. It is necessary that they have specific engineering training and experience. To meet the situation, two courses of action have been adopted by the State Highway Department authorities. The first step in solving this problem is to adopt the system of advancing present employees, with long years of progressive experience, to more responsible positions. Many of the employees in this category have enhanced their value to the State and the Department through their

efforts at self-education, carried out under a systematic and regular program, and are now holding responsible assignments through such methods.

The second course, in our efforts to solve this difficult problem, is to give employment to graduates of engineering schools of recognized standing. While they lack the years of practical experience, their sense of adaptability and perception is good. As a result, a lesser period of progressive experience is required which results in quicker yet very satisfactory progress.

In spite of the fact that an increase in salary scale was made effective to all employees in April 1949, this inducement has not entirely met the situation. The Department has been keenly aware, for some time, that it has been placed at a disadvantage in obtaining and holding the class of employee it needs for its highly skilled and exacting work. The relatively low salaries paid by the Department have not kept pace with the higher salaries paid by private industries and other agencies employing similar skilled technicians. Higher wages in other fields are attracting the more eligible persons who, in former years, were willing to accept employment in a lower bracket with the hope and expectation of gradually advancing to more responsible and higher paying positions.

Graduates from engineering schools all over the Nation, as well as from the engineering classes of our own University, enter private industry or other agencies at starting salaries far in excess of those which this Department can offer. As a result the Department suffers.

Employees of this Department are enjoying the benefits of the Nevada State Employees Retirement Act since the Act became effective two years ago. The Department has been benefited in that older employees have been induced to remain with the Departmnt to enjoy the provisions of the Retirement Act. These employees have stayed with the Department, whereas, otherwise they might have been able to step out and secure positions in private industry and other agencies enjoying a higher pay scale. As a result of the Act, during the past biennium, 22 of our employees who have attained retirement age have taken advantage of the Act and are now retired from the Department. It has therefore been necessary to recruit new personnel to fill these vacancies.

Lack of sufficient experienced personnel has reflected, in a measure, during the past biennium, in delays to preparations of plans, the acquisition of rights of way, and the staffing of crews to supervise construction projects.

In spite of the difficulties experienced, the personnel which has remained with the Department, has shown a deep sense of loyalty and the employees have, during the past two years, given their very best efforts towards the successful functioning of the Nevada Department of Highways.

CONSTRUCTION

Between July 1, 1948, and June 30, 1950, 57 contracts were awarded covering the construction or reconstruction of 433.61 miles of highways at a total bid amount of $9,420,064.14.

Of these 57 contracts 33 were completed during the biennium, covering 253.338 miles at a total contract cost of $4,702,488.19. Contracts under way but not completed on July 1, 1950, numbered 24 covering 180.272 miles of construction, with a contract cost of $4,523,079.45.

In addition to the foregoing, 24 contracts awarded prior to July 1, 1948, were completed during this biennium, covering 223.574 miles of construction, contract cost of which was $4,233,933.32.

During the biennium the U. S. Bureau of Public Roads awarded six construction contracts, the total amount of which was $1,034,021.71.

Of the 57 contracts awarded during the biennium, 11 covering 71.44

New construction of secondary roads is accomplished quickly and economically by contractors. Modern equipment operated by the contractors, does, today, in a few hours, jobs that took weeks to finish twenty years ago.

miles were for construction of plantmixed asphaltic surface; 27 covering 273.527 miles were for roadmixed asphaltic surface, and six covering 87.143 miles were for gravel surface. The remaining 13 contracts covered various items of work, such as removing trees and buildings from the right of way, constructing maintenance buildings, installing lighting facilities, etc.

The largest single contract awarded during the biennium, the final amount of which was $746,227.89, covered work on Charleston Boulevard in Las Vegas, the principal items of which were the construction of a reinforced concrete underpass under the Union Pacific Railroad tracks and the installation of some three miles of reinforced concrete storm drain of varying diameters from 30 to 42 inches placed at depths ranging up to a maximum of some 23 feet. This, incidentally, is the

largest single contract ever awarded by the State Highway Department.

Some of the other large contracts awarded during the biennium were: one amounting to $437,466.45 for the construction of a four-lane highway from Henderson to Boulder City, a distance of 10.089 miles in Clark County; two contracts totaling $710,755.16 for 4.95 miles of four-lane highway south of Reno in Washoe County; one for $375,986.93 for 23.33 miles between Sod House and Quinn River Crossing in Humboldt County; one for $338,090.92 for 16.209 miles between Boone Springs and White Horse Pass; one for $351,233.22 for 12.367 miles between Oasis and Silver Zone, both in Elko County; two contracts totaling $464,331.29 for 11.416 miles between Fernley and Hazen in Lyon and Churchill Counties; and two contracts totaling $565,605.04 for 20.912 miles from Panaca Junction to the Utah State Line in Lincoln County.

One amounting to $303,109.75 for 16.183 miles from Goldfield to Miller's Cutoff Road in Esmeralda County; and two contracts amounting to $399,817.72, covering 29.747 miles of grading and 54.249 miles of roadmix asphaltic surface between Round Mountain and the Junction of State Route 8A and U S 50 east of Austin in Nye and Lander Counties.

ROADWAY DESIGN

Preparation of plans, specifications and estimates for construction projects and betterment projects are the function of the roadway design department. In addition, nearly all special designs required by the Department including buildings, charts, special details, plans assembly for bridge and other special projects, are prepared by this department.

All work from the inception of project to the compilation of data complete for advertising for bids is coordinated through the design department. Location reconnaissance and surveys are reviewed. Project statement maps and other maps required for Federal-Aid Projects are prepared. Preliminary plans and data such as alignment and profile, drainage features and size of structures, soil characteristics, type and location of available materials, structural design and right of way needs, are furnished to the Materials and Research Department, Bridge Department, Right of Way Department and Construction Divisions for their respective uses in making specialized detailed investigations of the various phases which control design. Results of these individual investigations are then correlated and incorporated in the completed plans. Final reviews of plans and specifications are made in the field by division engineers and engineering representatives of the Bureau of Public Roads, before plans are considered acceptable for advertising.

During the past biennium, plan assemblies were completed for 63 projects, all of which were placed under construction. Represented by these plans were 333.9 miles of new construction or reconstruction, 117.5 miles of bituminous surfacing only, construction of four bridges and one underpass, and widening and reconstruction of three bridges and one overpass. Miscellaneous plans and specifications prepared

BEFORE AND AFTER

Looking south along South Virginia Street. Moving of power lines and buildings resulted in a wider highway and improved property values.

included those for moving or adjusting numerous buildings and service stations, construction of maintenance buildings at Wellington, Gardnerville, Austin and Winnemucca, right of way clearing projects, incidental roadway projects including lighting systems and channelization, and other minor projects.

Total cost of preparing all plans, specifications and estimates, including miscellaneous projects, during the biennium was $298,376. This is a slight rise over the previous biennium but is in line with generally rising costs and the larger amount of miscellaneous work performed. The total mileage of 451.4 miles of plans prepared for highways included 195.9 miles on the primary highway system and 255.5 miles on the secondary highway system.

Basic design principles have changed but little during the past two years. There has, however, been an increasingly large amount of highly detailed work. Particularly in and around the larger centers of population where private improvements have been constructed almost continuously bordering on right of way lines, intricate and extensive studies have been necessary to design needed roadway improvements without damaging or destroying private investments. Too often has lack of adequate local controls permitted development of abutting properties without regard to probable highway needs. This has resulted in costly inconvenience with loss to both the State and to the abutting owner. Such problems are becoming more frequent and are materially slowing plan preparation as well as increasing costs. Higher roadway types required by present heavier traffic volumes are also adding to the amount of detailed work necessary before plans can be advertised.

During the past biennium an average of approximately 40 employees have been engaged in the execution of the work of roadway design. About one-third of this group are designers, while the remainder are classified as draftsmen, computers and aides.

Manpower deficiencies have not been as acute as in preceding years, although it is still difficult to obtain and retain the services of trained engineering personnel. Inducements offered by private industry and other agencies provide extreme competition. In an attempt to overcome this situation, summer employment has been offered during the past two years to University of Nevada students enrolled in Civil Engineering. Their temporary employment, in addition to relieving the manpower needs at peak of the design season, has been a means of inducing them to seek full-time employment upon graduation. In addition, the Department has cooperated with the University in promoting highway engineering courses, thus giving students the opportunity to select highway engineering as a life work. This program has borne fruit in that several graduates have accepted employment and are now working with the Department. The design section, in addition to training college students, has served as a training school, and many employees of the Department, now engaged in other phases of highway work, have received most of their basic training while employed as members of the road design group.

BEFORE AND AFTER

Kietzke Lane—Looking North to Junction at Mill Street. Note buildings which had to be moved to clear the acquired 100-foot right of way. This wide right of way will provide ample width for future improvement.

RIGHT OF WAY DEPARTMENT

The Right of Way Division of the Nevada State Highway Department has been hard pressed during the biennium to acquire the necessary rights of way to keep pace with the expanded construction program. Limited office and drafting room space, and the increasing difficulty in securing rights of way have been the main factors in this "bottleneck." With the completion of the new State Office Building, the Right of Way Division will have adequate space so that some expansion will be possible. This expansion of right of way personnel will be accomplished by "on the job training" for the various classifications. As for the difficulty in securing rights of way, this will continue to become more and more of a problem as large holdings are broken up into smaller tracts, land prices increase, and more people become involved in individual tracts through land mortgages, trust deeds, etc. Improvement of highways in the urban areas demands the services of the right of way agent, or agents, on a full-time basis, in each area. Again, the solution is to train more personnel in title search, appraisal procedure, deed and agreement writing, preparing legal descriptions, public relations and the many other phases of right of way work.

At the present time the right of way division consists of 13 employees; a right of way engineer, an office engineer, one clerk-stenographer, five right of way agents, and five right of way draftsmen. To the right of way engineer and agents fall the burden of securing the necessary lands for rights of way, clearing or determining the method of clearing, all encroachments from newly acquired rights of way, determining damages, if any, to abutting property owners, presenting to property owners the proposed plans for the construction or reconstruction of a highway and in conjunction with the design division determine how said work will affect the property and determine what the property owner is entitled to in the way of adjustments, such as ditches, drainage structures, fences, approaches, etc. The allowable adjustments are then incorporated into an agreement which is signed by the property owner and the State. This agreement is then submitted to the design division so that all the terms therein are embodied in the plans and specifications. The right of way division also determines ownership and royalties and secures material options for all material deposits, arranges for the clearing and moving of public utilities and prepares all required maps and affidavits for the withdrawal of highway rights of way and material deposits on Federal lands. To be able to accomplish all of the above, it can readily be seen that the right of way agent must be experienced and have a working knowledge of a wide variety of subjects. For instance, he must be able to make title searches to determine ownership, ferret out the various types of liens on a property, determine land and property values, determine damages incurred by taking and severance, understand irrigation and drainage, understand highway design and construction, understand and know the laws applicable, to be able to write agreements, easements, deeds, releases and other legal instruments and last, but not least, be able to meet the public, gain their confidence, and secure the necessary rights of way in an amicable and fair manner.

At times is it impossible to reach a satisfactory agreement, then the land is taken by condemnation proceedings. However, this is resorted to as a last possible recourse and during the biennium the Department had only five condemnation suits.

The right of way agents' job is by no means finished after the right of way is secured and the contract awarded; any time a property owner feels that his property is being damaged during or after construction, the right of way agent who secured the land is generally contacted by said property owner and it then becomes his job to negotiate a settlement between the owner and the Highway Department. This brings out the fact that the right of way division, and more particularly the right of way agents, are probably the strongest public relation group within the Highway Department. It cannot be too highly emphasized that men of high personal character, experience and specialized knowledge must be employed to fulfill this assignment.

The right of way office engineer, right of way draftsmen, and clerk-stenographer prepare all necessary maps and sketches, help prepare all the required documents and file all pertinent information pertaining to any and all rights of way that have been acquired by the Department since its origin. Considerable research is always required to determine old rights of way in relation to proposed new alignment and to keep maps and records complete and up to date. The right of way division is continually being called upon to furnish information to local surveyors, people trying to locate sections corners, people trying to determine ownership of land joining highways, people trying to determine the highway right of way width so that signs and buildings can be erected, and many other requests of a varied and sundry nature.

During the biennium, rights of way were secured for 25 secondary highway projects and for 19 primary highway projects. A total of 440 individual parcels, 1,334 acres, of privately owned land was acquired and cleared of old buildings and other obstacles before and during construction, involving a total cost of $260,000; 9,607 acres of Federal land for rights of way and 5,480 acres for material deposits located on Federal land were withdrawn for highway use; and 15 parcels of privately owned lands containing 19 acres were acquired for maintenance station sites at a cost of $3,375.

Additional personnel will be secured and trained for this division because it is evident that the increased Federal-aid program will require more and more right of way acquisitions, and it is also evident that the task of securing rights of way will continue to become more and more difficult as the price of land and property increases, and highways within towns, cities and agricultural districts require widening as a result of increased traffic.

PLANNING SURVEY

Now in its fifteenth year of active operation, the Planning Survey was created as one of a series of such agencies set up within the State highway departments of all the States for the major purpose of developing factual data through the conduct of broad surveys and studies. The importance of the planning survey from the national point of view is borne out by continuation of Federal participation in an

amount "not to exceed 1½ percentum of the amount apportioned for any year to any State under the Federal Highway Act" to be used "with or without State funds for surveys, plans, engineering, and economic investigations of projects for future construction in such State, and for highway research necessary in connection therewith."

Our present matching ratio of funds is on the basis of 82.69 percent Federal and 17.31 percent State moneys, or such that on a $10,000 project Federal participation would be $8,269 while that of the State would be $1,731.

Activities in the Planning Survey are carried on under five divisions, and following is a summarization of accomplishments under each during the last two fiscal years:

INVENTORY

Original inventory activities began in December 1935 and were completed in 1936; however, improvements on rural roads, changes in cultural features, and the extension of corporate city limits altered the picture, and approximately five years later, in the spring of 1941, a reinventory program was inaugurated. Unsettled world conditions of the early 1940's brought this work to a standstill, and it was March of 1946 before reinventory operations were again undertaken. Logging, or measuring of roads, is carried on by a "one-man party" operating a car equipped with special gyroscope, odometer, and dictaphone equipment.

During the last two fiscal years, reinventory of rural roads has been completed in Clark, Douglas, Lyon, Storey, and Washoe Counties, and the reinventory of Pershing County is now under way.

In 1948, a reconnaissance of the Nevada-Utah State line was made from the corner common to Idaho-Utah-Nevada southerly to Wendover, and State-line crossings at county roads were established for mapping purposes. Utah also planned to utilize these State-line crossings in its mapping program.

Early in 1949, logging of the streets of Reno and Sparks was completed.

The streets of all incorporated cities in the State were logged in order to make data available to the Nevada Tax Commission for use in connection with distribution of the one-half cent gas tax levy granted to the counties by an Act of the 1949 State Legislature.

Two men were assigned to a field job in Lincoln County to pick up partial control and to identify known land points on aerial photographs for use in proposed planimetric mapping in that county.

All State-interest roads were logged in those counties which were not completely reinventoried, thus placing the Department in a position to furnish a true picture of existing road conditions to interested political subdivisions and to public agencies.

MAPPING

Revision of the map sheets for Douglas, Ormsby, Storey, and Washoe Counties has been completed, and work is now under way on the Clark and Lyon County sheets. The incorporated cities of Carson City, Las Vegas, North Las Vegas, Lovelock, Reno, Sparks, and Yerington were also mapped. All completed maps have received approval

of the U. S. Bureau of Public Roads and are available for distribution. State traffic-flow maps for 1948 and 1949 were prepared and are available.

Records reveal that approximately four thousand map sheets were sold during the two fiscal years and approximately $2,260 was collected. These moneys represent fees charged to cover the cost of reproduction.

More than one hundred thousand copies of "Nevada Highways," the official State road map, were distributed during each of the two fiscal years. Recipients, residents of the United States and foreign countries, have been attracted to Nevada. Their tourist business has more

Parallel parking, resurfaced streets, and new curbs and gutters, offer less traffic congestion on Aultman Street in Ely.

than justified the expense of map preparation and cost of distribution.

Numerous descriptive sketches and diagrams were prepared to accompany reports of this and other divisions of the Department.

TRAFFIC

A recount of traffic in Clark, Douglas, Ormsby, Storey, and Washoe Counties was completed, as well as traffic studies in the Reno-Sparks and the Las Vegas urban areas. Reinventory of Lyon County and the city of Yerington is now under way. In Lyon County, a modified version of the method used for Clark County is being employed; that is, a man permanently stationed in Yerington not only maintains and operates the recorder stations but also tabulates the recorder data for use in headquarters compilations.

Fixed automatic recorders are operated at 19 selected stations throughout the State, and it is believed the recordings at these stations

give a representative picture of vehicular traffic. In the appendix, Table No. 15, will be found a tabulated comparison of average daily traffic at each recorder site for six fiscal years; 1940–1941, which was the last year unaffected by wartime restrictions; 1943–1944, representing the low wartime volume; and the last four fiscal years, showing the traffic trend as on the increase. The data accumulated from these fixed recorders are used to expand short-period counts to full-time coverage so that year-around information may be obtained, thus eliminating the necessity for repetitious counts throughout the year.

Our annual traffic census was first inaugurated by the Department in 1923, and is conducted each July during a week which does not conflict with the Fourth of July holiday. A comprehensive study of the 1948 census revealed that the average of the Monday and Friday traffic on all routes was almost identical to the average daily traffic of all five weekdays. Therefore, as an economy measure, in 1949, the manual counts were conducted throughout a 16-hour period on a Friday, Saturday, Sunday, and Monday. Each year the Department publishes a pamphlet which carries concise tabulated traffic figures for the stations included in the census, classified as to commercial, foreign, and Nevada vehicles.

For the purpose of obtaining a more accurate classification of traffic on a year-around basis, manual 8-hour or 16-hour counts are conducted one day each January at 43 of the July manual-count stations regarded as key road junctions.

In addition to its regular activities, the planning survey is often called upon by public offices to conduct special counts necessitated by traffic problems, expansion projects, and studies to eliminate hazardous conditions existing in congested areas and in the vicinity of schools.

FINANCIAL

The three main phases of the financial section's continuing program are the fiscal survey, the statistical, and the road-life studies.

Fiscal Survey.

This survey should be considered in two parts—first, the gathering of facts for analysis of highway income and expenditures of all governmental units below that of State level from data furnished by the State's local taxing units, consisting of the 17 counties, 15 incorporated cities, and Henderson, an unincorporated town; and secondly, the compilation of similar ready reference data on all State highway operations.

Because of the ever-mounting demand for new roads, plus the greatly increased cost per mile of construction and maintenance, the information gathered by the fiscal survey throughout the past 14 years has become of paramount value to all officials confronted with problems dealing with highway legislation, planning, and construction.

Statistical.

The statistical studies are in direct correlation with the fiscal survey and the road-life studies. Monthly tables and graphs are prepared to show the major sources of motor vehicle revenue, namely, motor vehicle registration fees, carrier license fees, and motor vehicle fuel taxes.

Road Life.

The road-life section is engaged in a continuing study which comprises a history of every section of highway of State interest, with special emphasis on the life of the various types of roads and the cost of reconstruction, etc. This study provides a means of predetermining those roads which will require resurfacing or reconstruction within the immediate future, as well as the cost of maintaining the interstate highway system, operations essential to the protection and preservation of the State's existing investment.

In addition, information for our annual Federal-aid and U. S. road logs emanates from the road-life studies.

SPECIAL STUDIES

Planning survey facilities were employed in various studies requested by the Department and by the U. S. Bureau of Public Roads.

A traffic study along Aultman Street in the city of Ely was made to determine if traffic at the major intersections warranted signal lights.

Special turning-movement studies were made at several intersections in Reno. Reports of the findings for the intersections on Fourth Street (U S 40), at West and at Chestnut Streets were prepared. Other special traffic-flow studies were made in Reno at major intersections of Virginia Street (U S 395), namely, at First Street, Island Avenue, Mill Street, and further south at the intersection of Mary and Center Streets. A special pedestrian count was also taken along Wells Avenue to determine the necessity of stop lights for the protection of school children.

Turning-movement studies were conducted, and several speed studies were requested by public offices for use as a basis to determine the need for speed zoning.

Speed and car-occupancy studies were conducted at six regularly scheduled sites—on U S 395, north of the Reno Army Air Base; on U S 40, three miles east of the Fernley Overpass; on U S 50, north of the Ely Airport; on U S 50, near Lane City, west of Ely; on U S 91, near Arden Junction south of Las Vegas; and on U S 93 and 95, east of Las Vegas.

Annual truck-weight studies were made at 10 regular sites.

Of interest is the fact that the U. S. Bureau of Public Roads has requested quarterly loadometer studies as a regular function of this Department. The Planning Survey is now formulating plans for the development of a schedule which will be satisfactory to the Federal agency and to the Department.

A study of great import was one created by the Federal-Aid Highway Act of 1948, wherein the U. S. Commissioner of Public Roads was directed to cooperate with the State highway departments in a study of the status of improvement of the National System of Interstate Highways. Physical features, conditions, and traffic characteristics of U S 40 and U S 91, the interstate routes within Nevada, were depicted in diagrams and on code sheets as prescribed by the U. S. Bureau of Public Roads.

Other important activities were the Federal-aid Secondary County Inventory and the Area Maintenance Cost Study. These studies were also made at the specific request of the U. S. Bureau of Public Roads, and reports on rural road surface types, cultural items, vehicle miles, types of route service, and cost figures were tabulated. As an outgrowth of these studies, several of the counties have shown interest in developing accounting systems for their road departments which will present readily available figures on the various phases of their operations.

SURVEYS AND RECONNAISSANCE

During the biennium, it has been possible to more closely correlate survey work with projects proposed for early construction, thereby eliminating the long period intervening between the original survey and construction.

Through past experiences it has been learned that it is unwise to make location surveys too far in advance of any possible construction. This usually results in a new survey having to be made when the project is finally programmed for construction. With time, and the elements, a survey will, within a few years, become lost with regard to workable traces as staked on the ground. Also, in some instances where a survey is made several years in advance of any contemplated construction, a new survey is made necessary due to changes in traffic conditions, changes in alignment standards and roadway design, also developments along the route.

A considerable portion of the survey work as carried on during this past biennium has been on secondary highway projects. Most secondary routes carry a comparatively low volume of traffic as compared to primary highway routes. This makes it possible to construct most secondary highway projects on a considerably cheaper design, resulting in a greater construction mileage with a like amount of funds.

During the previous biennium some study and some surveys were made to alleviate the increasing traffic conditions through towns and urban areas. Some of these projects have been completed or are under construction at this time. During this past biennium, survey work on these projects has been further advanced. Most of the survey work performed on primary routes during this past biennium was in urban areas, through towns or adjacent to towns. These urban projects involve considerably more time and expense as compared to out-of-town areas. This additional work is due mostly to improvements adjacent to the line of survey and the detailed notes which are necessary for roadway design work, preparation of plans and the securing of rights of way. In many instances it has been necessary to revise a survey several times before final plans can be prepared and rights of way satisfactorily secured. These survey changes are most always due to right of way conditions, sometimes created by new improvements in the interim from the time of the original survey to the securing of rights of way and preparing of plans.

The total survey cost on urban projects is often four or five times greater than that on a project of similar length outside urban areas. This additional cost of urban surveys is indicated in the average cost

per mile of surveys completed during the past biennial period. However, a portion of this increased cost is incurred through a general rise in prices; salaries of engineering personnel; and equipment and supplies necessary in properly performing location surveys. During the past biennial period, 351.5 miles of surveys were completed throughout the State, at an average cost of $638.34 per mile.

TRAFFIC AND SIGNS

The Department of Traffic and Signs, headed by the traffic engineer, is responsible for centerline striping, and the production and placing of signs on the State highway system. Traffic studies are also

Extra lane for slow-moving vehicles, plus better alignment, has eliminated traffic hazards on the Pequops Summit road.

conducted in cooperation with the Planning Division. Considerable time has been devoted to cooperating with cities and counties on their respective local traffic problems.

The placing of a center stripe, as a means of encouraging drivers to stay in their proper lanes, constitutes one of the greatest single factors contributing to safety, therefore, the center-striping program has been considerably increased. Highways within major cities are striped twice a year and other highways once a year. Approximately 2,400 miles of highway are striped yearly at a cost of approximately $70,000. The pattern of striping, namely the skip centerline and solid barrier line, is in accordance with standards set by the American Association of State Highway Officials and is now in use by 31 of the 48 States, plus four provinces in Canada.

The majority of Nevada's towns and cities have adopted a uniform speed limit of 25 miles per hour and several have inaugurated parallel parking, resulting in a safer and more efficient movement of traffic. As a safety measure, this department has signed school crossings in many urban areas on the improved State highway system.

All signs, except U. S. route markers, are manufactured in the department's sign production shop in Reno and all warning, regulatory and directional signs are being fabricated of reflecting material in accordance with national standards, making them effective both night and day. All nonstandard signs are being replaced as maintenance demands. The greatest loss of signs is through vandalism, and this type of damage has been increasing to the extent where the replacement cost is now approximately $1,000 per month.

The Department now maintains approximately 12,500 highway signs throughout the State. The demand for additional signs is increasing daily. The placing of regulatory and warning signs in certain locations for the purpose of warning and advising motorists can only be effective when the signs are placed in such a manner as to avoid confusion on the part of the motorist. In some cases, too many signs carrying the same warning message have been placed in the same hazardous area. The result is confusion, and a feeling of disrespect for such warning signs is born within the motorist. The Department is, therefore, studying each hazard area prior to signing, and is endeavoring to place the proper number of signs to provide adequate warning to the traveling public.

BRIDGES AND GRADE SEPARATION STRUCTURES

During the biennium much of the work of the Bridge Department consisted of replacing timber bridges. Twelve concrete structures have replaced timber bridges or timber culverts, reducing maintenance costs as well as increasing capacity of the structures. The timber decks of two steel bridges at Caliente were replaced with concrete.

The department has found that reinforced concrete box-type structures are economical to build, especially when long spans are not necessary or where poor foundation material is encountered. Maintenance of this type of structure is very low and these structures are simple to build. Fifteen bridges of this description have been built during the biennium. They range in size from double 10-foot and double 12-foot spans to the eight-span box, 100 feet long, located just south of Las Vegas.

The Charleston Boulevard Underpass in Las Vegas was also completed during the past two years. This underpass, with the approach side-slopes of concrete, may be considered among the many beautiful structures in the State. Construction and location were made with a thought to the future widening on the south to make a four-lane roadway. The present design offers a 30-foot roadway and a sidewalk on the northern side. No pumps are required for drainage because a gravity drain is combined with street storm drains extending 2½ miles to the east and built with the cooperation of the city of Las Vegas.

Two structures have been completed for which plans were prepared

BEFORE AND AFTER

A hazardous railroad crossing is eliminated. The Charleston Underpass, in Las Vegas, not only made highway travel safer, but also aided in the beautifying of the adjacent area.

for use as postwar projects. This completes all such bridge projects. One is a steel bridge over the power canal at Verdi and the other is the widening of the overpass just east of Fernley. Each eliminates a narrow structure on U S 40.

On the Bridge and Grade Separation Summary table No. 12 the total number of bridges completed or under construction is shown as 19. This does not include five structures which were widened. The total cost of the 24 structures, without approaches, is $612,674.

MATERIALS TESTING AND RESEARCH

Importance of testing materials for building highways cannot be over-emphasized. Good service behavior of our highways depends upon good quality of materials built into them as much as upon sound design and good construction practice. The materials testing and inspection part of the highway program thus contributes in a large way to the length and life of the highway dollar.

Testing and inspection of all materials going into highway and bridge construction and maintenance is required by the State Highway Department, also by the U. S. Bureau of Public Roads where Federal funds are involved.

As a matter of fact, the Bureau of Public Roads requires for each Federal-aid construction job that all test and inspection records shall be on file and shall show the materials have complied with specification requirements before the final Federal-aid voucher is approved for payment. Periodic inspection of certain portions of the Department's laboratory equipment and test procedures are made by a representative of the U. S. Bureau of Standards. The laboratory is required to keep abreast of changes and improvements made in test methods and equipment.

The principal classifications of the duties performed by the materials testing department are as follows: To make materials surveys in which soils, gravel, and other deposits are investigated preliminary to designing a particular job; to check all processed materials for quality during actual construction; to test materials used in maintenance of highways and bridges and in traffic control; to train personnel for field testing; to make special investigations regarding performance of certain road sections or certain materials; and to prepare special reports and aid in preparation of specifications. These duties have been explained in previous biennial reports.

Another duty assumed voluntarily by the testing department is the operation of the official U. S. Weather Station for Carson City. This duty requires attention every day, including holidays and Sundays, and is done by the individuals responsible without remuneration.

Continued improvement in the manner of making materials surveys has been noticeable during the past biennium. Use of heavy equipment to replace old hand-labor methods has proven very satisfactory. A field crew is kept busy the year-around making these materials investigations.

Both the volume and scope of materials testing have shown tremendous increase during the past two decades. Such increase is due in part to increase in the volume of construction, but is due also to an

increasingly intensified testing program, the objectives of which are the securing of the best materials within economical reach, and closer control in their production.

The total number of samples tested in the laboratory at Carson City during the biennium was 10,121. This figure is almost five times that of the 1927–1928 biennium when the total was 2,030. The two-year period, 1946–1948 gave a figure of 8,783 samples. Thus, there was a 16 percent increase in volume of tests in the period covered by this report over that of the previous biennium.

The 10,121 samples tested during this biennium include only those tested in the laboratory at headquarters in Carson City. Several thousand additional samples were taken for production control of various kinds of aggregate, and were tested in the field. A small field laboratory is built on each job and is equipped and staffed to do this work.

A breakdown of the samples tested in the headquarters laboratory into principal classifications is as follows:

Soils (subgrade)	1,818
Gravel base and surface	2,653
Materials for Portland Cement concrete	2,515
Bituminous materials	1,959
Culvert pipe, all types	841
Metallic materials except culvert pipe	215
Materials for masonry, rip rap, etc	120
Total	10,121

About 10 percent of the testing performed in the headquarters laboratory is done for branches of government and other agencies outside the Highway Department. The nature of such work has been explained in detail in previous biennial reports. It is done as a matter of accommodation because other testing facilities are not available in this area. A charge is made to cover the cost of such work.

EQUIPMENT DIVISION

The biennium ending June 30, 1950, finds conditions governing the purchase of supplies, parts, tires, materials and equipment, necessary for adequate highway maintenance, about as they were during the period 1942–1944. All steel, bronze, copper, machined parts, lead, tires, batteries and antifreeze can no longer be purchased on the open market as needed. Requirements must be anticipated and orders placed on a 60-90 and 120 day delivery basis with the cost increasing in some instances 80 percent above the prices current in 1942.

Passenger cars are still available, but all other equipment is on a deferred delivery basis. The Department is in great need of replacements for suburbans for the engineering crews but the latest information indicates that deliveries cannot be made until 1951. At present the Department is able to purchase different makes of passenger cars at a price not to exceed the statutory limit of $2,500, but price increases expected later in 1950 will raise two or three manufacturers' lines above the price the Department is legally permitted to pay.

All equipment operated by the Department is adequately maintained in the division shops located in Las Vegas, Ely, Elko, Tonopah, and Carson City, and at the headquarters equipment shop in Reno. Most of the major overhauls are made at the Reno plant.

The following improvements for equipment storage and maintenance facilities have been completed by Department personnel during the biennium:

1. A concrete floor has been added to the equipment storage sheds in Carson for the stalls occupied by the snow-removal equipment during the winter months.
2. A new roof has been placed on the passenger car storage garage in Carson.
3. An unloading and oil storage ramp has been constructed in the Carson City maintenance yards.
4. A concrete brick structure has been completed in the Carson City maintenance yards to house the radio equipment for the Public Service Commission and the Highway Department.
5. Fencing has been placed around the additional ground obtained by legislative authority from the Nevada State Hospital for Mental Diseases at Sparks.

Other improvements in Reno include:

6. A spur track from the Southern Pacific main lines has been run into the Highway Department property. This will facilitate the unloading of heavy equipment and road oil and keep Highway Department equipment from needless travel over the streets of the city of Reno.
7. A new unloading ramp to handle rail car, truck and low-bed trailer equipment.
8. A 60-foot shed has been completed in the south yards of the plant to store the oil equipment during the winter months.
9. A shed has been completed to store engineering and maintenance equipment during the winter months.
10. A shed has been completed to store the Department's stock of hubs, stakes, guineas, lath and signposts.
11. A new wash rack was completed during the biennium.
12. The former wash rack and paint shop has been remodeled to take care of additional space needed for mechanics' benches.
13. The stock room has been completely remodeled to give the Department one of the most modern and efficient parts stock room in the State.
14. New shower and change rooms have been constructed for the Department's personnel at the Reno plant.

All buildings and structures under the supervision of the Equipment Division have been properly maintained.

DIVISION ONE

Division One, with headquarters in Las Vegas and comprising approximately 515 miles of constructed highway, has experienced a very successful two-year period.

Five contracts were completed at a total cost of $1,399,604.46 and at the present time two contracts are in the process of construction totaling $462,762.

The contracts of major importance consisted of the four-lane highway from Henderson to Boulder City at a cost of $437,466 and the construction of the Charleston Underpass in the city of Las Vegas at a cost of $668,856.

This latter contract was unusual in respect to a large storm drain connected with it. An excavated trench for concrete reinforced pipe varied in depth from 5 feet at the outlet end to 25 feet at the structure, for a distance of 2.8 miles.

This deep trench imposed considerable hazard on the contractor's operations. He had to protect power lines, water and gas mains as well as several buildings which were in danger of being damaged by his operations. The amount of water encountered was also a major problem.

The construction of this storm drain is of great importance as it develops an outlet for surplus waters during the heavy runoffs from seasonal storms. In urban areas, where no such means has been provided, the development of private property along the highway has created a drainage problem which is serious and embarrassing.

Maintenance activities in Division One have been characterized by the absence of the usual cloudburst damage typical of the summer months in southern Nevada. Offsetting the need to repair washout damage, the winter of 1948 and 1949 brought a unique snow removal problem to this area. Snow laid on the ground for some two weeks and was heavy enough in the vicinity of Las Vegas to threaten a blocking of highway traffic. Snow removal in this area normally is confined to the Charleston Park area, thus only one snow plow was available. The most pressing points of trouble were cleared with motor patrols which were effective enough in the wet snow encountered, but rather slow.

Some 50 miles of highway radiating from Lathrop Wells were sealed with 0.25 gallons per square yard of high viscosity emulsified asphalt and covered with pit-run volcanic cinders from a nearby cinder cone, applied through a spreader box.

These cinders weigh only 50 pounds per cubic foot so 8 cubic-yard boxes were mounted on two and one-half cubic-yard trucks to handle this material. These cinders are quite satisfactory as a cover coat in this area as the traffic concentration is not heavy, making their lack of resistance to abrasion a minor factor. They present a pleasing wine-red color and offer an excellent nonskid surface. Good results were obtained by using this material to sand icy spots in the Mount Charleston area.

Considerable difficulty has been experienced with pavement edge ravelling on the 18-foot pavements on routes No. 93 and No. 95. The right outside dual of dual-tired trucks hangs over the edge of this pavement, causing rapid breakdown at the edge of the oil. An ingenious outfit to widen this edge has been devised by one of the two-man maintenance crews working on this type of roadway. Three or four yards of cinders are loaded into a dump truck and dumped into a skid-mounted hopper via a built-in chute which has an adjustment plate to control the speed of discharge. The hopper has a small 2-foot blade set at a 45-degree angle. Four spray nozzles for bituminous material

are mounted immediately behind the strikeoff blade but preceding the opening through which the cinders reach the roadway. A 300-gallon asphalt distributor is hooked behind the cinder truck and a pull roller completes the assembly. In operation, one man locates the dump truck so that the blade on the skid hopper is just to the pavement edge then follows this line. The second man rides near the hopper and controls the flow of both the oil and cinders. A neat, widened section of 18 inches results which resists whipoff and defines the pavement edge.

Two 35-horsepower diesel patrols with front-end loaders have been obtained during this period. These outfits have given excellent service, making it possible for a two-man crew to both clean and load out material from ditch-cleaning operations with a minimum of hand operations, at a gratifying decrease in cost.

An attachment to a front-end loader bucket was devised to clean cut ditches through a decomposed area. An extension was bolted to the left side of the bucket 15 inches wide and some 8 inches deeper than the normal cutting face of the bucket. The cutting face of the bucket rides on the roadway pavement and the bucket extension shapes and loads the material filling the normal roadway ditch. A considerable saving of labor is thus effected as the material in this section cannot be satisfactorily worked with a patrol due to undecomposed granite. The load obtained at one pass is small of course, but with a truck worked in conjunction, a surprising amount of material can be loaded out in a day.

DIVISION TWO

Division Two with headquarters in Reno, located on the second floor of the Washoe County Library Building, includes that portion of the State Highway system within Churchill, Douglas, Lyon, Ormsby, Storey, Washoe and portions of Lander, Mineral, and Pershing Counties. A total of 875 miles of highway are now being maintained in this division.

Construction work in Division Two, for the biennium, consisted of the construction of approximately 48 miles of road on secondary routes and the construction or reconstruction of approximately 37 miles of road on primary routes.

The Federal-aid secondary projects completed during the biennium are:

Pershing County—Upper Valley Loop, Cemetery Road Extension, Lower Valley Extension, Lovelock Airport road, and the Imlay connection.

Churchill County—Fallon 5 miles easterly toward Stillwater, Taylor Street in Fallon and Soda Lake road.

Lyon County—Dalzell Canyon road, Bridge over Fernley canal, and approaches to Fernley canal bridge.

Washoe County—From 10 miles north of Pyramid Lake Indian Reservation boundary to 23 miles north, Prater Way in Sparks, Kietzke Lane, and Mt. Rose road from Ski Bowl to Mt. Rose Lodge.

Contracts on regular Federal-aid routes completed during the biennium included reconstruction from Cradlebaugh Bridge to south city

limits of Carson City, Hash Lane to Mt. Rose Street south of Reno, realignment and widening from California-Nevada State line to Topaz Junction, realignment through Verdi, realignment from Fernley to Hazen, including widening of Fernley Overpass and placing a new plantmix surface 24 feet in width from north city limits of Carson City to Washoe City.

Reconstruction of the Reno-Carson highway from Hash Lane to Mt. Rose Street in Reno, a distance of 2.45 miles, is particularly outstanding, being the first four-lane highway constructed in the vicinity of Reno. From Hash Lane to Peckham Lane the roadbed is 68 feet in width, including four 12-foot traffic lanes, two 8-foot shoulders and a 4-foot median strip. From Peckham Lane northerly to Mt. Rose Street, through an urban area, concrete curbs with 8-foot gutters have been constructed, 68 feet curb to curb, with four 12-foot traffic lanes and a 4-foot median strip. At the more important intersections, Moana Lane, Airport Road and Wells Avenue, the roadway has been widened to six traffic lanes to expedite left turning. Street lights are also being installed at these intersections with flashing lights at the Anderson School. The traffic on this section of road is particularly heavy and the completion of this four-lane section has greatly relieved serious congestion.

Construction of this four-lane section of road is being continued from Hash Lane to Huffakers, a distance of 2.5 miles, under a contract let in March 1950.

Special maintenance work in Division Two included reconditioning of seven miles of roadway, resurfacing of 36 miles and sealing and sanding of 100 miles of roadway surface.

A contract was let in April 1950, for the construction of two standard maintenance stations. One of these stations is being constructed in Wellington and the other in Gardnerville.

DIVISION THREE

Division Three, with headquarters in Elko, maintains 715 miles of road in Elko, Humboldt, and parts of Lander, Eureka, and White Pine Counties. During the biennium, seven contracts totaling 68.5 miles of highway were completed at a cost of $1,198,745. Four contracts costing $1,014,440, involving a little more than 52 miles, were under construction at the close of the period.

Completed projects include 26 miles of road from Elko to Wild Horse Reservoir, 7 miles of 24-foot wide gravel-surfaced road from Ruby Valley to the Junction U S 93 near Warm Springs, and 23 miles from Sod House to 30 miles south of Denio. Other contracts completed during the period includes a 6-mile section north of Wells, moving of Southern Pacific section buildings in Elko, 4 miles of construction in northeastern Elko County, and widening of Idaho Street in the city of Elko.

Contracts started during the biennium, but not completed, include 17 miles of gravel-surfaced road near Dinner Station to 7 miles southeast of Tuscarora, 11 miles of oiled surface southwest of Battle Mountain to Battle Mountain, 11 miles northerly, extending from the south fork of Humboldt River to a junction with the Elko-Lamoille road, and 12 miles of oil from Oasis to Silver Zone overpass.

Special maintenance work in the division included sealing and sanding of portions of the roadway between Wells and the Nevada-Idaho State line at an approximate cost of $12,172, roadmix of shoulders on portions of the road between Pequop Summit and the Nevada-Utah State line, and reconditioning on portions of the road from Deeth toward Wells. These two portions were done at an estimated cost of $14,480 and $14,130, respectively.

The Division has obtained a new preparizer which will pulverize old bituminous pavement, making it invaluable on maintenance jobs where old pavement must be broken and reworked.

The Pequop maintenance station has been improved with the installation of a new water system complete with concrete water tank and gravity-feed pipe line. A new maintenance house was built at the North Fork station to provide living quarters for the maintenance crew. A new sewer system with septic tank was also installed. Diesel storage tanks are being installed at the maintenance stations in this division, and it is anticipated that all stations will be so equipped by the end of the calendar year.

DIVISION FOUR

Division Four, with headquarters at East Ely, includes the State Highway System in White Pine County and portions of Elko, Eureka, Lincoln, and Nye Counties. Prior to January 1, 1949, it also included a portion of Lander County. The Lander County section was made part of Division Five at that time.

During the biennium July 1948, to June 1950, 16.21 miles of new construction, with asphaltic roadmix surface, was completed in Elko County on U. S. Highway 50 between Boone Springs and White Horse Pass.

In White Pine County, 15.21 miles of asphaltic roadmix surface, on U. S. Highway 50 from Magnuson's Ranch north, was completed early in the biennium. At the close of the biennium, the contract was nearing completion for the widening and placing of plantmix surface on Aultman Street through the city of Ely, including new sidewalks, curbs, and gutters, and placing of plantmix surface from the East Ely overpass to McGill, a distance of 10.37 miles.

Construction of secondary systems in White Pine County performed during this period consisted of 11.29 miles of grade, drain, and gravel surface from Strawberry north to Hunt's Ranch.

In Lincoln County, 10.37 miles of construction, with asphaltic roadmix surface, was completed from a junction with U S 93 near Panaca to 10 miles east of Panaca, with an additional 10 miles under construction and about 25 percent completed at the close of the biennium. Other work in this county consisted of the following:

Resurfacing of 6.01 miles of U S 93 from 5 miles west of Caliente to a junction of Spring and Front Streets in Caliente, including redecking of two bridges, one on each end of Caliente across the Meadow Valley Wash.

Construction of 5.24 miles of roadway, with asphaltic roadmix surface, from three miles south of Pioche to two and one-half miles north of Pioche, was 90 percent complete at the close of the biennium.

Grading and graveling of 11.57 miles of secondary highways in

By providing proper storage facilities at Tonopah, more efficient and economical division operations could be obtained.

Lincoln County, from five miles south of Comet Coalition to Caselton Mill, was about 40 percent completed.

The contract was let but no work was performed on oiling and road-mixing the surface on nine miles of roadway from Pioche to Ursine.

Division Four maintains 645 miles of asphalt-surfaced roads and 150 miles of gravel-surfaced roads. Excluding headquarters, there are 10 maintenance stations in this Division. Each station has a foreman with one or two helpers, with mileage maintained varying from 50 to 90 miles.

Ninety miles of roadway, leading in four directions from Ely, are maintained by headquarters. A swing crew operating out of headquarters performs extraordinary maintenance operations such as sealing, reconditioning, flood control and, when necessary, snow removal when extreme conditions exist.

The winter of 1948 and 1949 resulted in an extremely heavy snowfall in Division Four, accompanied by strong winds which made snow removal difficult.

In addition to the effort required to keep the roads open for traffic throughout the Division, the crews kept Yelland Air Field and the Delamar Flight Strip plowed free of snow to supplement the Haylift, which saw extensive operations in this district. Also, many of the ranch roads were plowed open by the Department to assist delivery of the hay and feed to the ranchers.

Crews worked around the clock in many instances and additional equipment and men were borrowed from other divisions throughout the State to assist with the operations.

The winter of 1949 and 1950 was comparatively mild and all maintenance stations were able to handle their snow removal without additional aid from East Ely headquarters.

During the biennium, heavy seal and chips have been applied on approximately 100 miles of roadway throughout the division. About eight miles of existing roadmix surface has been scarified, remixed and relaid.

A repair shop, blacksmith shop, and paint shop are operated at East Ely headquarters.

One caterpillar motor patrol and a Barber Greene screening plant have been purchased and two F.W.D. trucks have been replaced.

A new maintenance station has been established between Sacramento Pass and Baker, with two houses provided for a maintenance foreman and his helper. The garage is yet to be built for housing the equipment.

DIVISION FIVE

Division Five, with headquarters in Tonopah, maintains approximately 745 miles of highway in Esmeralda, Lander, Mineral, and Nye Counties. On January 1, 1949, approximately 90 miles of highway centering around Austin, were transferred from Division Four to Division Five. The Lida and Beatty maintenance stations were abandoned on July 1, 1949, and August 1, 1950, respectively. Both stations were closed in the interest of economy. The maintenance station at Willow Springs was moved to a more central location in Smoky Valley and two maintenance houses were constructed.

Five contracts were completed during the biennium and two contracts were under construction at the end of the biennium.

Following are the completed contracts:

Five miles on S R 31, 25 miles south of Hawthorne.

Seven miles on U S 95, Tonopah north to Millers.

Twenty-nine miles on S R 8A, Milletts north to Junction U S 50 (grading only).

Fifty-four miles on S R 8A, Round Mountain north to Junction S R 8A and U S 50 (roadmix only). This was one of the longest oil jobs ever let in the State.

Construction of one new maintenance house and remodeling one old maintenance house at the new Smoky Valley Station.

Following are the contracts under construction at the present time:

Thirteen miles on S R 31, 20 miles south of Hawthorne.

Sixteen miles on U S 95, Goldfield to Miller's Cutoff.

During the biennium, on maintenance, a total of 12.5 miles were widened and reconditioned with the majority of the work done on Austin Summit where one-half mile of new alignment was constructed. Twenty miles of sealing and screening work was also completed. A total of 12,000 cubic yards of three-quarter inch maximum-size gravel and 2,500 cubic yards of screenings were made and stockpiled at various points throughout the division to be used in future maintenance work. A total of 252,000 gallons of SC-3 asphalt material and 91,000 gallons of emulsified asphalt were used during this period. A new spring was found and developed for additional water at the Rattlesnake maintenance station. Additional land was acquired and leveled to build a new maintenance garage in Austin. The painting of 2,000 culvert markers and the placing of 500 new culvert markers and guideposts were completed.

In addition to the regular maintenance crews assigned definite sections to maintain, Division Five has a five-man construction or swing crew performing as trouble shooters for the entire division. This crew is composed of equipment operators with equipment to do all of the reconditioning work, seal coating, cloudburst repairs and production of gravel and sceenings. During bad snow years this crew aids in snow removal.

Small tow rollers have been used to very good advantage in this division to compact road shoulders and to improve the appearance of the roadway.

A new type grid roller has been used in pulverizing old roadmix and to date has proven fairly successful.

The division shop has mounted a portable pressure lubricating machine on one of the old dump trucks and has simplified the equipment maintenance both on the swing crew and at the maintenance stations located in the outlying districts. A traction road broom has been outfitted with water tanks which more than doubles the life of the broom cores.

Additional and replacement equipment received by the division includes 3 heavy-duty trucks, 1 small truck, 2 pickups, 1 coupe, 1 four-wheel trailer, 1 wing plow, 12 small plows, 1 grid roller, 1 screening plant, 6 small rollers, 4 four-hundred gallon pressure distributors, and 3 motor patrols.

APPENDIX

TABLE NO. 1
STATEMENT OF RECEIPTS

Classification	1917-1948	1949	1950	Total	Percentage
Legislative appropriation	$40,000.00			$40,000.00	.03
State tax levy	1,869,468.87			1,869,468.87	1.54
Auto license fees (net)	5,199,918.72	$441,938.65	$480,103.37	6,121,960.74	5.05
Gasoline and use fuel tax (gross)	27,046,605.77	2,718,654.97	2,852,791.21	32,618,051.95	26.91
Common carrier license	5,232,479.83	683,235.62	823,595.40	6,739,310.85	5.56
Driver's license	331,846.08	72,009.92	42,602.08	446,458.08	.37
Certificate of title	44,509.05			44,509.05	.04
Racing Commission fees	147,428.86			147,428.86	.12
Contractor's license	16,234.23			16,234.23	.01
Miscellaneous	1,147,865.21	190,153.06	74,073.57	1,412,091.84	1.16
State highway bonds	1,900,000.00			1,900,000.00	1.57
Federal participation on construction	56,780,612.35	3,664,359.88	4,366,214.87	64,811,187.10	53.46
County participation on construction	4,118,085.75	2,500.00	362.12	4,120,947.87	3.40
County participation on State maintenance	59,000.00			59,000.00	.05
County participation on county maintenance performed by State	116,654.73			116,654.73	.10
Lincoln Highway participation on construction	71,426.60			71,426.60	.06
Utah-Nevada-California Assn. participation on construction	23,831.47			23,831.47	.02
San Francisco-Bay City participation on construction	25,000.00			25,000.00	.02
City participation on construction	218,387.24	254,331.80	5,300.72	478,019.76	.39
Railway participation on grade-crossing construction	169,088.30			169,088.30	.14
	$104,558,443.06	$8,027,183.90	$8,645,043.34	$121,230,670.30	100.00

TABLE NO. 2
STATEMENT OF DISBURSEMENTS

Classification	1917-1948	1949	1950	Total	Percentage
Highway construction	$72,115,866.38	$4,959,459.61	$5,536,996.07	$82,612,322.06	68.36
Surveys, plans, right-of-way, and preliminary engineering	4,232,825.04	480,644.26	515,800.03	5,229,269.33	4.33
Maintenance	15,986,666.94	1,405,657.62	1,469,479.06	18,861,803.62	15.61
County maintenance	114,846.29			114,846.29	.09
Equipment divisions and plants	2,904,615.64	361,827.12	246,466.25	3,512,909.01	2.91
Maintenance buildings	264,384.42	50,940.58	83,572.45	398,897.45	.33
Accounts receivable	1,050,573.26	221,955.54	39,406.55	1,311,935.35	1.08
Section "31" refunds	40,107.17			40,107.17	.04
County highway bond redemption	232,168.01			232,168.01	.19
Laboratory building	21,642.18			21,642.18	.02
General administration	2,856,604.37	191,762.14	205,096.45	3,253,462.96	2.69
Highway bulletin and publicity	98,058.65	29,382.99	39,434.20	166,875.84	.14
Public relations	2,358.98	3,651.76	9,285.73	15,296.47	.01
Road information	28,015.69	1,054.51	90.57	29,160.77	.02
Road map		6,783.06	7,883.83	14,666.89	.01
Landscape—architect department	15,097.01			15,097.01	.01
Roadside improvement	4,754.04			4,754.04	.01
Special highway traffic count	138,125.90	16,087.04	10,257.63	164,470.57	.14
Safety division	52,305.02	16,802.26	10,763.25	79,870.53	.07
Traffic and sign department	68,767.20	8,774.64		77,541.84	.06
Sign division (Reno)	176,028.05	15,432.18		191,460.23	.16
Pavement striping	251,978.95	23,416.56		275,395.51	.23
Driver's license division	355,102.25	67,204.89	43,866.03	466,173.17	.38
Police patrol (highway)	341,623.60		112,860.02	454,483.62	.38
Common carrier license expense	85,905.09			85,905.09	.07
Public Service Commission inspectors	383,405.86	76,218.87		459,624.73	.38
Public Service Commission salaries			3,400.00	3,400.00	.01
Public Service Commission—Motor Vehicle Department			37,526.18	37,526.18	.03
Common carrier and truck refunds	28,504.36	312.66	849.43	29,666.45	.02
Gasoline and use fuel tax refunds	1,833,337.66	201,843.55	149,078.21	2,184,259.42	1.81
Gasoline tax administration	182,286.83	13,913.02	10,899.11	107,098.96	.09
Use fuel tax administration	46,270.83	6,932.48	6,125.03	59,328.34	.05
Research and investigation		98,420.33	110,546.24	208,966.57	.17
State office building		50,000.00	75,000.00	125,000.00	.10
	$103,812,225.67	$8,308,477.67	$8,724,682.32	$120,845,385.66	100.00
Transfer to Revolving Fund	52,452.02	40,000.00		92,452.02	
	$103,864,677.69	$8,348,477.67	$8,724,682.32	$120,937,837.68	

Reconcilement—

Total receipts	$121,230,670.30
Total disbursements	120,937,837.68
State Highway balance July 1, 1950	$292,832.62
Lists filed July 5, 1950, included in disbursements	632,345.74
State Controller's balance July 1, 1950	$925,178.36

TABLE NO. 3
STATEMENT OF RECEIPTS AND DISBURSEMENTS FOR THE PERIOD JULY 1, 1948, TO JUNE 30, 1950

RECEIPTS	1949	1950	Total	Percentage
Federal aid	$3,664,359.88	$4,366,214.87	$8,030,574.75	48.17
County and others	256,831.80	5,662.84	262,494.64	1.57
Miscellaneous	190,153.06	74,073.57	264,226.63	1.58
Gasoline and use fuel tax (gross)	2,718,654.97	2,852,791.21	5,571,446.18	33.42
Auto license fee (net)	441,938.65	480,103.37	922,042.02	5.53
Common carrier license	683,235.62	823,595.40	1,506,831.02	9.04
Driver's license	72,009.92	42,602.08	114,612.00	.69
	$8,027,183.90	$8,645,043.34	$16,672,227.24	100.00
DISBURSEMENTS				
General administration	$191,762.14	$205,096.45	$396,858.59	2.33
Special traffic surveys	16,087.04	10,257.63	26,344.67	.15
Road information	1,054.51	90.57	1,145.08	.01
Road maps	6,783.06	7,883.83	14,666.89	.08
Highway bulletin and publicity	29,382.99	39,434.20	68,817.19	.40
Public relations	3,651.76	9,285.73	12,937.49	.08
Traffic and sign department	8,774.64		8,774.64	.05
Sign department (Reno)	15,432.18		15,432.18	.09
Pavement striping	23,416.56		23,416.56	.14
Safety division	16,802.26	10,763.25	27,565.51	.16
Driver's license division	67,204.89	43,866.03	111,070.92	.65
Public Service Commission inspectors	76,218.87		76,218.87	.45
Public Service Commission salaries		3,400.00	3,400.00	.02
Public Service Commission—Motor Vehicle Department		37,526.18	37,526.18	.22
Gasoline and use fuel tax refunds	201,843.55	149,078.21	350,921.76	2.06
Gasoline tax administration	13,913.02	10,899.11	24,812.13	.15
Use fuel tax administration	6,932.48	6,125.03	13,057.51	.08
Common carrier refunds	312.66	849.43	1,162.09	.01
Maintenance work	1,405,657.62	1,469,479.06	2,875,136.68	16.88
Surveys, plans, right-of-way, etc.	480,644.26	515,800.03	996,444.29	5.86
Equipment division and plants	361,827.12	246,466.25	608,293.37	3.57
Maintenance buildings	50,940.58	83,572.45	134,513.03	.79
Highway construction	4,959,459.61	5,536,996.07	10,496,455.68	61.62
Police patrol (highway)		112,860.02	112,860.02	.66
Research and investigation	98,420.33	110,546.24	208,966.57	1.23
State office building	50,000.00	75,000.00	125,000.00	.73
Miscellaneous	221,955.54	39,406.55	261,362.09	1.53
	$8,308,477.67	$8,724,682.32	$17,033,159.99	100.00

TABLE NO. 4
FEDERAL AID ALLOTMENTS

1921	and prior—Regular	$3,527,276.18
1922	Regular	953,436.78
1923	Regular	635,624.52
1924	Regular	826,360.27
1925	Regular	947,623.25
1926	Regular	956,576.00
1927	Regular	948,318.00
1928	Regular	948,510.00
1929	Regular	957,995.00
1930	Regular	960,375.00
1930	Public lands	588,914.00
1931	Regular	1,601,408.00
1931	Unused portion Hawaii allotment	4,288.00
1931	Advance	904,961.83
1932	Regular	1,598,987.00
1932	Public lands	440,683.00
1933	Regular	1,421,688.63
1933	Emergency	1,575,756.00
1934	National recovery	4,545,917.00
1935	National recovery	2,302,356.00
1935	Public lands	542,125.00
1936	Regular	1,595,501.00
1936	Public lands	553,135.00
1936	Works program highway	2,243,074.00
1936	Works program grade-crossing elimination	887,260.00
1937	Regular	1,593,978.00
1938	Regular	1,632,385.00
1938	Secondary highways	326,477.00
1938	Grade-crossing elimination	250,000.00
1938	Public lands	560,201.00
1939	Regular	1,590,172.00
1939	Secondary highways	318,034.00
1939	Grade crossings	243,750.00
1939	Public lands	559,895.00
1940	Regular	1,275,938.00
1940	Secondary highways	191,391.00
1940	Grade crossings	97,500.00
1940	Public lands	212,442.00
1940	Regular (reapportioned from other States)	6,718.00
1940	Secondary (reapportioned from other States)	690.00
1940	Grade crossings (reapportioned from other States)	781.00
1941	Regular	1,462,071.00
1941	Secondary highways	190,705.00
1941	Grade crossings	146,250.00
1941	Public lands	436,062.00
1941	Regular (reapportioned from Georgia)	4,919.00
1941	Secondary (reapportioned from Georgia)	738.00
1941	Grade crossings (reapportioned from Georgia)	358.00
1942	Regular	1,274,718.00
1942	Secondary highways	223,076.00
1942	Grade crossings	97,500.00
1942	Public lands	310,692.00
1943	Regular	1,275,386.00
1943	Secondary highways	223,193.00
1943	Grade crossings	97,500.00
1943	Strategic net	318,847.00
1943	Advance engineering	127,539.00
1946	Regular	2,868,043.00
1946	Secondary highways	1,921,867.00
1946	Urban	60,613.00
1947	Regular	2,868,649.00
1947	Secondary highways	1,922,269.00
1947	Urban	60,613.00
1948	Regular	2,829,804.00
1948	Secondary highways	1,896,250.00
1948	Urban	59,836.00
1950	Regular	2,564,998.00
1950	Secondary highways	1,718,707.00
1950	Urban	53,853.00
1951	Regular	2,562,973.00
1951	Secondary highways	1,717,361.00
1951	Urban	53,853.00
Subtotal		$70,677,744.46

OTHER FEDERAL FUNDS UTILIZED

Access road funds	$1,958,757.90
Flight strips (special)	629,621.09
Flight strips (regular)	572,576.82
Subtotal	$3,160,955.81
Total	$73,838,700.27

TABLE NO. 5
MILEAGE OF ROADS MAINTAINED BY ROAD TYPES, FISCAL YEAR ENDING JUNE 30, 1949

		Miles	Percent
1. Earth		27.9	0.79
Unimproved	27.7		
Graded and drained	0.2		
2. Gravel		330.6	9.42
3. Mixed bituminous		3,054.6	87.08
Road mix	2,529.2		
Plant mix	525.4		
4. Other hard surface		94.9	2.71
Portland cement concrete	7.7		
Bituminous concrete	23.0		
Bituminous penetration	20.9		
Combination	12.4		
Bituminous surface treated	30.9		
Total		3,508.0	100.00

Mileage Maintained by Systems, Fiscal Year Ending June 30, 1949

		Miles	Percent
1. Federal aid primary		2,187.7	62.37
Rural	2,145.0		
Urban	42.7		
2. Federal aid secondary		1,187.2	33.84
Rural	1,179.2		
Urban	8.0		
3. State system		112.5	3.21
Rural	111.4		
Urban	1.1		
4. County, rural		3.2	0.09
5. Access roads, rural		17.4	0.49
Total		3,508.0	100.00

TABLE NO. 6
MILEAGE OF ROADS MAINTAINED BY ROAD TYPES, FISCAL YEAR ENDING JUNE 30, 1950

		Miles	Percent
1. Earth		0.6	0.01
Unimproved	0.4		
Graded and drained	0.2		
2. Gravel		354.0	9.93
3. Mixed bituminous		3,119.4	87.48
4. Other hard surface		91.9	2.58
Portland cement concrete	4.8		
Bituminous concrete	20.6		
Bituminous penetration	20.9		
Combination	14.7		
Bituminous surface treated	30.9		
Total		3,565.9	100.00

Mileage Maintained by Systems, Fiscal Year Ending June 30, 1950

		Miles	Percent
1. Federal aid primary		2,203.9	61.82
Rural	2,160.7		
Urban	43.2		
2. Federal aid secondary		1,232.3	34.55
Rural	1,223.7		
Urban	8.6		
3. State system		112.4	3.15
Rural	110.5		
Urban	1.9		
4. County, rural			
5. Access roads, rural		17.3	0.48
Total		3,565.9	100.00

TABLE NO. 7

EXPENDITURES FOR VARIOUS MAINTENANCE OPERATIONS ON ALL ROADS MAINTAINED BY THE DEPARTMENT, FISCAL YEAR ENDING JUNE 30, 1949.

Operation	Expenditures	Percentage
Building and repairing shoulders	$133,426.10	9.34
Filling joints and cracks and patching surfaces	251,374.03	17.59
Cleaning ditches and culverts	38,915.97	2.72
Cutting weeds and brush	68,684.75	4.81
Dragging and blading (graded and gravel roads)	29,696.39	2.08
Repairing surface ditches	5,165.56	.36
Raking rocks	3,747.89	.26
Signs and markers	81,133.50	5.68
Removing slides and trimming slopes	45,296.07	3.17
Washouts	18,228.11	1.28
Hauling and spreading patching material	4,801.74	.34
Snow removal	343,694.80	24.05
Guard rail	6,605.63	.46
Riprapping and protecting slopes	1,497.55	.11
Removing debris and waste material along right-of-way	31,307.65	2.19
Building and repairing culverts	3,859.52	.27
Reconditioning	37,016.95	2.59
Building and repairing fences and gates on right-of-way	3,752.34	.26
Painting traffic and center lines	48,420.02	3.39
Snow and sand fences	4,002.48	.28
Maintenance of houses	38,799.21	2.71
Seal coating	132,634.46	9.28
New road approaches	2,320.52	.16
Landscape	8,811.79	.62
Flattening slopes	583.00	.04
Sanding icy roads	39,082.67	2.73
Rent, heat, light, etc., of garages, storage sheds, etc.	17,866.31	1.25
Maintenance of roadside parks	2,739.49	.19
Bridge maintenance	8,457.54	.59
Idle equipment time	2,052.24	.14
Patrolling for protection of motoring public	5,642.73	.40
Total direct expenditures	$1,419,617.01	99.34
Maintenance administration (Headquarters)	9,457.17	.66
Total	$1,429,074.18	100.00
Average cost of maintenance per mile	$407.38	

TABLE NO. 8

EXPENDITURES FOR VARIOUS MAINTENANCE OPERATIONS ON ALL ROADS MAINTAINED BY THE DEPARTMENT, FISCAL YEAR ENDING JUNE 30, 1950.

Operation	Expenditures	Percentage
Patching holes, ruts, and spot sealing	$213,866.00	14.55
Dragging and blading (graded and gravel roads)	35,415.37	2.41
Filling and trimming expansion joints and cracks	970.79	.07
Applying light seal and blotter or chips	30,316.40	2.06
Application of dust palliatives	313.56	.02
Sand, gravel, and crushed stone replacement	1,777.36	.12
Reconditioning bituminous surfaces	43,963.82	3.00
Bituminous surface treating, heavy chips and seal, etc.	151,476.53	10.31
Dragging, blading, and patching shoulders and approaches	195,623.65	13.31
Bituminous treatment of shoulders	43,622.08	2.97
Construction of new approaches	2,879.35	.20
Reconditioning bituminous shoulder surfaces	1,303.82	.09
Repairing cuts, fills, and slopes	68,258.41	4.64
Cleaning or retrenching drains, channels, etc.	63,443.79	4.32
Removal of debris and waste material	163,490.37	11.13
Roadside development	7,715.32	.52
Repair and maintenance of sidewalks, dikes, etc.	7,776.21	.53
Repairing, repainting, resetting markers, signals, etc.	131,132.62	8.92
Traffic lane and center striping	71,908.88	4.89
Repair and maintenance of guard rails	18,089.46	1.23
Highway, bridge and approach lighting	66.09	.01
Comfort stations, picnic grounds, and roadside parks	5,877.11	.40
Traffic and pedestrian crossing markings	2,135.03	.14
Patrolling for protection of motoring public	13,214.04	.90
Erection and removal of snow fences, markers, etc.	17,756.63	1.21
Snow and ice removal	122,277.34	8.32
Sanding icy surfaces	27,972.96	1.90
Opening waterways and gutters due to snow and ice	2,741.78	.19
Removal of sand drifts	428.25	.03
Maintaining road blockades during storms	623.39	.04
Cleaning and opening channels	1,839.46	.12
Repairing structures	2,680.26	.19
Painting, applying linseed oil treatment to structures	1,205.60	.09
Maintaining pumping plants and electricity in structures	1,481.35	.10
Bridge inspection	461.78	.03
Extraordinary repairs due to catastrophe	2,721.04	.18
Total direct expenditures	$1,456,825.90	99.14
Maintenance administration (Headquarters)	12,653.16	.86
Total	$1,469,479.06	100.00
Average cost of maintenance per mile	$412.09	

TABLE NO. 9
MAINTENANCE COSTS FROM 1918–1950
(Includes Snow Removal)

	Mileage			Mileage	
1918	———	$16,596.54	1935	2,524.77	$617,784.47
1919	———	29,330.21	1936	2,656.68	675,726.06
1920	———	44,323.34	1937	2,697.82	846,033.35
1921	———	33,601.26	1938	2,770.20	756,305.26
1922	———	61,997.55	1939	2,805.90	830,877.69
1923	442.98	110,724.87	1940	2,908.48	763,075.33
1924	765.23	122,788.60	1941	2,941.22	774,573.50
1925	903.90	215,168.70	1942	3,015.76	848,789.57
1926	1,213.43	306,899.52	1943	3,047.80	745,480.25
1927	1,445.08	343,399.28	1944	3,084.67	703,340.85
1928	1,680.73	359,262.08	1945	3,081.740	773,778.26
1929	1,875.16	418,065.08	1946	3,093.242	855,194.89
1930	1,905.43	500,752.46	1947	3,273.091	1,051,422.22
1931*	2,061.34	301,166.64	1948	3,421.747	1,256,025.61
1932	2,113.02	618,377.41	1949	3,507.980	1,429,074.18
1933	2,151.64	566,845.41	1950	3,565.956	1,469,479.06
1934	2,287.37	502,715.66			

*Seven months' expenditures, December 1, 1930, to June 30, 1931.

TABLE NO. 10
SNOW-REMOVAL COSTS 1923–1950*

1923	$12,695.38	1937	$131,066.03
1924	884.53	1938	59,468.88
1925	1,479.13	1939	71,681.61
1926	1,803.43	1940	42,403.61
1927	8,228.95	1941	57,008.71
1928	3,167.50	1942	87,357.42
1929	16,172.05	1943	60,386.97
1930	19,466.28	1944	94,585.25
1931	4,711.45	1945	103,521.25
1932	83,632.96	1946	104,222.71
1933	83,497.61	1947	102,053.10
1934	8,227.13	1948	130,913.49
1935	28,573.76	1949	368,127.41
1936	50,948.37	1950	170,748.71

*Snow-removal costs prior to 1923 not available.

TABLE NO. 11

CONSTRUCTION AND RECONSTRUCTION COMPLETED AND UNDER CONTRACT ON THE DESIGNATED STATE HIGHWAY SYSTEM AT THE CLOSE OF THE BIENNIUM.

Type	Miles new construction completed during biennium	Miles reconstruction completed during biennium	Miles new highway under construction at close of biennium	Miles reconstruction not yet completed at close of biennium	Totals
Gravel	*102.8	-----	29.2	-----	132.0
Roadmix	†289.7	45.9	73.0	22.2	430.8
Plantmix	18.2	‡52.9	23.8	16.9	111.8
	410.7	98.8	126.0	39.1	674.6

*Includes 5.2 miles constructed with Forest Highway Funds by Bureau of Public Roads.

†Includes 5.5 miles constructed with Federal Lands Highway Funds by Bureau of Public Roads.

‡Includes 13.6 miles constructed with Federal Lands Highway Funds by Bureau of Public Roads.

TABLE NO. 12
BRIDGE AND GRADE SEPARATION SUMMARY

Type	Structures Built by State Highway Department				Structures on highway system *not* built by State Highway Department	Total structures as of June 30, 1950
	Completed or under construction as of June 30, 1948	Completed during biennium or under construction June 30, 1950	Structures abandoned during biennium	Total as of June 30, 1950		
Plain concrete	4	0	0	4	1	5
Reinforced concrete	88	16	0	*107	*1	108
Structural steel	27	3	1	29	11	40
Timber	65	0	9	56	14	70
Composite structures (reinforced concrete and structural steel)	11	0	0	11	0	11
Total	195	19	10	*207	*27	234
Total length of structures in feet	17,371	1,014	491	17,900	2,243	20,143

*Three bridges previously listed as not built by State in error now listed under those built by State.

TABLE NO. 13
DESCRIPTION OF FEDERAL-AID ROADS, JUNE 30, 1950

F. A. Road No.	Termini	Mileage[1]
1	From the California-Nevada State line southwest of Verdi via Reno, Fernley, Lovelock, Winnemucca, Battle Mountain, Elko, and Wells to the Nevada-Utah State line at Wendover, Utah	416.7
2	From the California-Nevada State line southwest of Spooners via Carson City, Dayton, Leeteville, Fallon, Austin, Eureka, and Ely to a junction with Federal Aid Road No. 1 near Wendover, Utah	468.0
3	From the California-Nevada State line south of Holbrook via Minden to a point on Federal Aid Road No. 2 approximately three miles south of Carson City, and from another point on Federal Aid Road No. 2 in Carson City via Reno to the Nevada-California State line northwest of Reno with a spur connection from a point near the south city limits of Reno via Wells Avenue to a junction with Federal Aid Road No. 1 in Reno	81.6
4	From the California-Nevada State line southwest of Basalt via Basalt, Coaldale, and Tonopah to a point on Federal Aid Road No. 2 in Ely, and from another point on Federal Aid Road No. 2 in East Ely via Connors Pass and Sacramento Pass to the Nevada-Utah State line en route to Delta, Utah	306.2
5	From the California-Nevada State line southwest of Jean via Jean to the south city limits of Las Vegas, and via Fifth Street in Las Vegas to Glendale, thence to the Nevada-Arizona State line northeast of Mesquite with an alternate route through Las Vegas via Main Street	129.7
6	From the California-Nevada State line south of Searchlight via Searchlight and Railroad Pass to a point on Federal Aid Road No. 5 alternate at Fremont Avenue and Main Street in Las Vegas, and from a point on Federal Aid Road No. 5 at North Fifth Street and Bonanza Road in Las Vegas via Beatty and Goldfield to a point on Federal Aid Road No. 4 in Tonopah, and from a point on Federal Aid Road No. 4 at Coaldale via Mina, Hawthorne, and Schurz to a point on Federal Aid Road No. 2 in Fallon, and from a point on Federal Aid Road No. 2 at Leeteville via Hazen to a point on Federal Aid Road No. 1 near Fernley, and from a point on Federal Aid Road No. 1 in Winnemucca via Orovada to the Nevada-Oregon State line at McDermitt with an alternate route through Las Vegas from the intersection of Charleston Boulevard and Fremont Avenue via Charleston Boulevard and Tonopah Drive to the intersection on Tonopah Drive and Bonanza Road, and with a spur from Railroad Pass via Boulder City to the Nevada-Arizona State line at Boulder Dam	526.7
7	From Caliente via Pioche to a point on Federal Aid Road No. 4 at the east foot of Connors Pass, and from a point on Federal Aid Road No. 2 approximately five miles south of the Elko-White Pine County line via Currie, Wells, and Contact to the Nevada-Idaho State line northeast of Contact	252.7
8	From a point on Federal Aid Road No. 7 approximately one mile west of Panaca via Panaca to the Nevada-Utah State line en route to Modena, Utah	20.9
Total		2,202.5

[1]Surveyed mileage used on roads having unimproved sections. As of June 30, 1950, there remained unimproved mileage on F. A. Route 8—10.5 miles.

TABLE NO. 14

TABLE SHOWING STATUS OF MILEAGE ON THE VARIOUS "STATE-INTEREST" HIGHWAY SYSTEMS IN NEVADA, AS OF DECEMBER 31, 1949

County	Improved by State Highway System: Federal aid system	Federal aid secondary system	Remaining State Highway system	Total	State-interest roads not improved by the State	Grand total, all types and systems
Churchill	152.1	50.9	------	203.0	61.0	264.0
Clark	276.8	114.2	0.1	391.1	251.1	642.2
Douglas	49.9	30.1	1.2	81.2	26.0	107.2
Elko	331.0	124.3	------	455.3	332.9	788.2
Esmeralda	115.9	50.3	50.0	216.2	36.8	253.0
Eureka	74.1	91.0	------	165.1	142.5	307.6
Humboldt	135.3	46.6	------	181.9	224.1	406.0
Lander	104.0	84.7	------	188.7	146.3	335.0
Lincoln	89.4	123.0	------	212.4	174.7	387.1
Lyon	63.4	129.0	------	192.4	95.5	287.9
Mineral	107.5	41.7	------	149.2	89.0	238.2
Nye	240.7	139.7	37.3	417.7	263.3	681.0
Ormsby	20.7	5.7	3.9	30.3	9.2	39.5
Pershing	75.0	23.9	------	98.9	185.7	284.6
Storey	------	12.6	------	12.6	23.2	35.8
Washoe	91.0	104.7	11.8	207.5	360.2	567.7
White Pine	265.2	70.8	------	336.0	136.9	472.9
Totals	2,192.0	1,243.2	104.3	3,539.5	2,558.4	6,097.9

STATE CONSTRUCTED MILEAGE BY SURFACE TYPES AND SYSTEMS AS OF DECEMBER 31, 1949

Type		Federal aid system	Federal aid secondary system	Remaining State Highway system	Total State system
(A-B)	Primitive and unimproved[2]	11.9	676.6	1,869.9	2,558.4
(C-D)	Graded and drained and soil surfaced	------	0.2	------	0.2
(E)	Gravel or crushed stone	------	211.5	50.0	261.5
(F)	Bituminous surface treated	------	39.5	------	39.5
(G)	Roadmix or plant-mix surface	2,131.0	992.0	54.3	3,177.3
(H-I)	High type bituminous	41.5	------	------	41.5
(J)	Portland Cement concrete	4.8	------	------	4.8
(M)	Combination surface types	14.7	------	------	14.7
Total improved[1]		2,192.0	1,243.2	104.3	3,539.5
Total all types		2,203.9	1,919.8	1,974.2	6,097.9

[1]Includes gravel or crushed stone and all higher surface types.
[2]Includes all mileage regardless of existing type if not constructed by State Highway Department or maintained by State under formal agreement.

TABLE NO. 15
COMPARISON OF AVERAGE DAILY TRAFFIC AT AUTOMATIC RECORDERS FOR SIX FISCAL YEAR PERIODS

Station	Location	Daily Average					
		1940-1941	1943-1944	1946-1947	1947-1948	1948-1949	1949-1950
101	U. S. 40, east of Sparks	1,451	967	2,120	2,281	2,286	2,573
102-A	U. S. 91 and 466, south of Las Vegas	2,471	915	2,249	2,347	2,497	2,561
103	State Route 46, south of Elko	268	116	237	290	309	417
104	U. S. 395, north of Carson City	1,557	668	1,775	1,820	1,688	1,847
106	State Route 59, south of Lovelock	189	202	415	316	314	334
107	U. S. 40, east of Elko	870	554	1,207	1,424	1,513	1,794
108	U. S. 50 and 93, north of McGill	468	224	392	488	475	499
109	U. S. 6 and 93, south of East Ely	503	270	388	440	438	432
110	U. S. 93, 95, and 466, southeast of Las Vegas	1,979	3,821	4,953	4,905	5,072	5,626
112	U. S. 6 and 95, west of Tonopah	410	384	416	461	465	498
114	U. S. 95, northwest of Las Vegas	255	342	371	395	404	427
115-A	U. S. 40, east of Wells	665	-----	761	819	847	905
116	U. S. 40, west of Verdi	1,371	811	1,916	2,104	2,153	2,485
117	State Route 12, north of Logandale	-----	-----	373	372	372	387
118	U. S. 50, south of Carson City	-----	-----	858	961	1,017	1,086
119	State Route 3, south of Yerington	-----	-----	474	455	527	554
120	U. S. 91 and 93, north of Nellis Air Force Base	-----	-----	-----	-----	-----	1,567
121	U. S. 40 and 95, northeast of Lovelock	-----	-----	-----	-----	-----	1,400
122	U. S. 40, west of Battle Mountain	-----	-----	-----	-----	-----	1,078

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